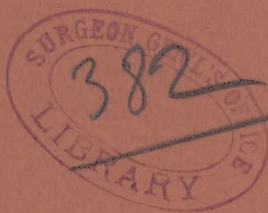


Palmer, (A. B.)

dry earth as a means
of disposing of excreta x



ATLAS
OF
SKIN DISEASES

BY
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DRY EARTH

AS A MEANS OF

DISPOSAL OF EXCRETA.

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IN NUTRITION, considered in the largest sense—in the maintenance of the body—in the selection and appropriation of proper nutrient particles and the rejection of others, and in the renewal of tissues so constantly occurring, rejected and worn out materials in a state ready to undergo decomposition, are constantly being expelled from the body by its various emunctories.

Human filth consists of matter after its uses in the system have ceased, undergoing destructive changes, and being offensive to the senses or noxious to the organism. Such residual and effete matters pass off chiefly by the alimentary canal, the kidneys, the skin and the lungs.

That from the lungs contaminates the air, rendering ventilation so essential. That from the skin passes chiefly into the air also, though a portion adheres to the surface and clothing, rendering ablution so important; while that from the kidneys and intestines is produced in such sensible and substantial quantities as to demand different methods of disposal.

The supply of free quantities of air in motion, communicating with the general atmosphere, carries away, diffuses and changes the

matters, passing off from the system in the form of gases and vapors. The application of water aided by the action of soap, most effectually cleanses the surface and the apparel; while the earth from which most of this matter is derived, is the proper final receptacle for all, and common sense would at once dictate that the sooner these materials are returned to the earth, the sooner and more completely is filth removed and destroyed.

Cleanliness, which John Wesley said was next to godliness, and in its broad sense is chief among the hygienic if not so high among the Christian virtues, consists in the speedy and constant removal of filth—in returning effete, decomposing, offensive, and injurious matter to the open air, the flowing water, and finally to the earth, where it may enter into combinations, destroying its noxious character, and preparing it for again entering into living organic forms.

The best methods for accomplishing these purposes are among the most important problems, social, hygienic and economic, of the present day.

The subject of ventilation and the best means of effecting it, was presented in a recent number of this Journal. That of ablution may be discussed hereafter, while that of the disposal of the more abundant excreta, especially *fæcal* will be presented in this article.

The importance of this subject cannot readily be exaggerated. The exposure, fermentation and decomposition of *fæcal* exuvia is now admitted by the highest authorities in the profession to be the most frequent essential or accessory cause of many of our more prevalent and fatal diseases. It is believed to be the exclusive, essential cause of typhoid fever, and is doubtless an important accessory cause, at least, of cholera and a large number of less severe affections. The facts and authorities which might be cited to sustain these statements are overwhelming and conclusive.

The writer of this was engaged with Professors Ford and Earle, in an investigation of the cause of a violent outbreak of typhoid fever in Maplewood Young Ladies' Institute, Pittsfield, Mass., in 1864. In this instance, within the short period of two or three weeks, of the 74 pupils residing in the Seminary Buildings, 51 had typhoid fever of a severe form. Ten others reported themselves to be more or less indisposed, and only eight stated that they were well; while 13 of the 51 cases of fever terminated fatally. The cause of this local epidemic, one of the severest on record, was traced by a series of positive facts, and a rigid process of exclusion, to emanations from the privies, which were in an offensive condition, and directly connected with the dormi-

tories by corridors, In a report on this local epidemic, first published in the Boston Medical and Surgical Journal, and afterwards in a pamphlet form, all the facts of the case are carefully presented, and have produced in the minds of those professional men who have examined the subject, the most positive conviction of the correctness of the conclusions arrived at.

The "National Hotel disease," which occurred in Washington in 1857, where a large number of the guests of the house were attacked almost simultaneously with a most severe enteric fever, was clearly traced to emanations from the privy, caused by obstructions of its sewers; and many other cases in this country, both in civil and military life, have been of an equally conclusive character.

Dr. William B. Carpenter's views on the subject of fermenting faecal and organic matter—privy, cess-pool, and sewer emanations, producing zymotic diseases, are well known to the profession. He believes that decomposing matter in the system, whether generated and retained there, or taken in from without, either in ingesta contaminated by sewerage, or in the inhalation of air containing emanations from night-oil or cess pools, either themselves produce disease, or serve as a nidus for the operation of more specific germ-poisons. He cites many cases to illustrate his views, one of which is here given. He says:

"The following case may be added in proof of the potency of an atmosphere charged with putrescent emanations in rendering the system liable to the attacks of zymotic diseases of various kinds.

"A manufactory of artificial manure, formerly existed immediately opposite Christ Church workhouse, Spitalfields, which building was occupied by about 400 children, with a few adult persons. Whenever the works were actively carried on, particularly when the wind blew in the direction of the house, there were produced numerous cases of fever of an intractable and typhoid character; a typhoid tendency was also observed in measles, smallpox, and other infantile diseases, and for some time there prevailed a most unmanageable and fatal form of aphthæ of the mouth, ending in gangrene." Many deaths occurred.

"The proprietor of the manufactory was compelled to close his establishment, and the children returned to their ordinary health."

"Five months afterwards the works were recommenced. In a day or two subsequently, the wind blowing from the manufactory, a most powerful stench pervaded the building. The night following, 45 of the boys, whose dormitories directly faced the manufactory, were again suddenly seized with diarrhœa whilst the girls, whose dormito-

ries were in a more distant part, and faced in a different direction, escaped.

"The manufactory having been again suppressed, there was no subsequent return of diarrhœa."

Dr. Williams, in his principles of medicine, says :

"The soil which drains from habitations contains, in addition to excrement, dirty water, the washings and remnants of animal and vegetable matter used as food, and other offal. All these are mixed together and stagnant in the corrupting slough that is retained in cess-pools and privies, or that is carried into sewers. Every ill-drained house has a Pandora's Box ready to pour forth its evils when occasion offers, and always oozing them out in degrees sufficient for the impairment of health."

"These materials continually poison both air and water; and typhoid fever, diarrhœa, cholera, dysentery, dyspepsia, inappetency, general weakness and mal-nutrition are the results of their pestiferous operation acting in different degrees."

Dr. Stramm, of Berlin, Germany, who has given many years of his life to the study of epidemic diseases in different parts of the world, believes in the possibility of annihilating nearly all such diseases by proper attention to cleanliness and other hygienic measures. He says: "Before erecting statues, building museums, and buying expensive pictures, towns should be relieved of bad odors and fermenting putrescence; and adds, "that good privies are far higher signs of civilization than grand palaces and museums of art." Among many other facts enforcing his views, he mentions that in certain wards of the Vienna General Hospital there was an epidemic of fever in the winter of 1862-63. In the wards on the second floor the disease prevailed by far the most extensively, and it was found that the pipes for the escape of gases from the cess-pools opened just above that floor in a garret which was quite closed. On proper ventilation the disease soon ceased.

From numerous instances, ancient and modern, Dr. Stramm concludes that wherever there is a bad odor there is, as a rule, *materies morbi*; and that when there are bad conditioned water-closets and cess-pools, poison will penetrate into dwellings, and when this is the case to the requisite extent, epidemics inevitably follow. He says that when the capital of Egypt was moved from Thebes to Memphis—from the upper country to the marshy lowlands, where proper drainage was impracticable, and where the infection of the air was carried on in an almost systematic manner—the empire gradually declined; and he

quotes Baron Liebig in ascribing to the bad system of sewerage adopted at its capital, the fall of the Roman Empire.

Dr. E. D. Mapother, Professor of Hygiene, and Medical Officer of Health of the city of Dublin, says: "Typhoid fever is about the most preventable of diseases, yet of this affection 140,000 cases occur, and at least 20,000 young persons, including many of the flower of the people, die every year in England." He attributes it to foul emanations, and says there is much greater risk of disease being communicated from the decomposition of materials and the production of poison in faulty sewers, than from the atmosphere about patients; and urges the use of disinfectants, and improvements in the condition of sewers and privies as the preventives of this disease "born of putrescence."

Dr. Charles Murchison, of the London Fever Hospital, in his excellent work on Fevers, applies the term pythogenic (literally "born of putridity") to typhoid fever, and is so well convinced of the particular form of decaying matter producing it, that he also calls it "night-soil fever." This able writer has collected a mass of facts bearing upon the subject, some of which are here given, condensed from his work.

In August, 1829, of 22 boys in a school at Clapham, England, 20 were seized, within three hours, with fever, vomiting, purging, and excessive prostration. One other boy had been seized with similar symptoms two days before, and died comatose, in 23 hours; another boy died in 55 hours, and the rest recovered. A careful investigation could detect no other cause than the opening and cleaning out of a drain which had been choked up many years, and which, when opened, emitted an offensive odor. This drain was at the back of the house where the boys were, and its opening was watched by them. Its contents were spread upon their play-ground. The symptoms and *post mortem* appearances were those of typhoid fever.

In 1838, a circumscribed typhoid fever broke out in Birmingham, England. About 50 cases occurred in the immediate neighborhood of a small stream, which was nothing more than an open sewer. The preceding season had been very hot, so that the stream was nearly dried up, and in some places almost stagnant. It disengaged extremely fœtid odors, especially during the night, which were complained of by the inhabitants.

In the same year typhoid fever prevailed in the Commune of Prades, in the Department of Ariege, France. Of 750 inhabitants, 310 were attacked and 95 died. The cause was traced to a stagnant pool, which was the receptacle of dead animals and of all the sewerage

of the district. The outbreak was preceded by damp, warm weather. Three times the pestilence returned and always when the wind was blowing over the infected water.

Another circumscribed outbreak of this same fever occurred in an isolated farm-house in the thinly peopled county of Peebles, N. B., in 1846, as recorded by Dr. Christison. Every one of the fifteen residents was seized with the fever, and three died. Many of the servants who worked on the farm during the day were also affected, but none communicated the disease to their families, who did not visit the farm. The cause was traced to the drains and sewers, all of which were found closed up and obstructed by the accumulated filth proceeding from the privies and the farm-yard, the effluvia from which was very offensive.

About Easter, 1848, a formidable outbreak of this fever occurred in the Westminster School and the Abbey Cloisters, in London. It produced a perfect panic in the neighborhood, particularly because of its central situation and because it affected "the better classes." Within a little more than eleven days it attacked thirty-six persons, three of whom died; and though so many less were affected and died in this case than at Maplewood, a large portion of the people of London, and indeed of England, were agitated by the event, and it has become classical under the name of the "Westminster fever." Shortly before its appearance there were a few days of peculiarly hot weather, and a disagreeable stench was complained of in the houses in question. It was found that the disease followed very exactly, in its course, the line of a foul and neglected sewer in which faecal matter had been accumulating for years, without proper exit, and which communicated by direct openings with the drains of all the buildings in which the fever occurred. The only exception was in the case of some boys living in a house at a little distance from those in which the drains opened: but they were in the habit of playing, every day, in a yard in which were gully-holes opening into the foul drain.

This case was minutely inquired into by the most eminent physicians of London, and the Metropolitan Sanitary Commission gave it as their decided opinion that the epidemic arose from the bad state of the sewers and drains of the precinct, and especially from the foul condition of the large sewer described.

In the autumn of 1853 a typhoid fever broke out in Croyden, England; and of a population of 16,000, 1800 were attacked and 60 died. The report of eminent medical men to the Secretary of State of England, who took official cognizance of the affair, showed that the escape

of sewer miasm, through imperfections in the sewerage drain-pipes, had been influential in producing the epidemic.

In November, 1853, in Cowbridge, Wales, an outbreak of typhoid fever suddenly occurred, under very peculiar circumstances. Two balls had been held at the hotel of the town, and were attended by about 140 persons from all parts of the surrounding country; and, shortly after, at their homes, many of these persons were attacked, and none others, and eight died. Poison in the food or drink was suspected; but the persons were attacked too long after the event for this supposition; and an investigation revealed the fact that a foul privy was in a passage leading from the house to a stable, and the loft over the stable had been used as a supper-room at the ball.

In the autumn of 1858 enteric fever broke out in Fleet Lane, London, while a sewer was being constructed. The sewer was open from June 29th to October 30th, and, during all this time, the inhabitants complained of the offensive smell. Soon after the sewer was opened diarrhœa began to appear, and enteric fever followed. Of 140 families in the lane, hardly one escaped. Those who investigated the subject attributed the fever to sewer miasms. It appeared soon after the sewer was opened; it disappeared when the sewer was closed; and, during the whole of the time, it was confined to the lane and its immediate neighborhood.

In the fall of 1858 an epidemic of typhoid fever prevailed at Windsor, England. As occurring in the immediate neighborhood of one of the royal residences, Windsor Castle, it was made a subject of special inquiry by the Medical Officer of the Privy Council. Within four months 440 persons—about one twentieth of the whole population—were attacked, and 39 died.

The disease seized rich and poor alike, and the cause seemed clearly to be traced to the escape of sewer gases, through defects in the drain, into the residences of the people attacked. There was a separate sewer for the Castle, which was kept in good condition, and no case of fever occurred there. Places only a street apart, but supplied, respectively, from the defective town-drain, and the perfect Castle-drain, in the one case suffered severely, and in the other escaped entirely.

The cases where fevers have been produced by drinking-water contaminated by cess-pools and sewerage material passing through a wet soil into wells and cisterns, if not as numerous are quite as conclusive.

In Williamstown, Mass., in June, 1860, typhoid fever broke out in a boarding house where some thirty persons, mostly students of Williams College, took their meals. In the course of two weeks 20

students fell sick. At the same table were several persons who drank of the water used by the others and none of these were affected, while all who drank the water unboiled had the disease. On examination it was found, "that a drain which received all the refuse of the house was choked near its exit into another drain, which conveyed surface water from a highly cultivated field, and which ran near the well." The privy of the house, with a common, rather superficial vault, was near the house drain. "The season was uncommonly wet, and the earth, in the immediately neighborhood of the well, was so completely saturated with organic matter, that it oozed through the ground and stood in pools of putrescence on the surface." Nothing peculiar in the quality of the water from the well was observed, when served upon the table with ice, but when becoming warm on standing, a disagreeable odor and taste was noticed.

In this instance, the proof of the disease being produced by the water was as conclusive as possible, particularly as no disease of the kind occurred in the neighborhood, and as it was found that those who drank most freely and exclusively of the water were most severely affected.

Another case referred to by Dr. Murchison is equally conclusive.

Richmond Terrace, Clifton, is a crescent composed of thirty-four houses. In 1847, the inhabitants of thirteen of these houses drew their drinking water from a well at the end of the crescent. The remaining houses were supplied with water from another source. At the end of September the water of the well gave evidence to the taste and smell of being tainted with sewerage. Early in October typhoid fever broke out, nearly at once, in all the thirteen houses in which the tainted water had been drunk, but did not make its appearance in any of the other houses. In almost every one of the thirteen houses two or three persons were ill, and in some a much larger number. The houses in which the fever broke out were far apart in the terrace, and there was little or no intercourse between their inmates—the water from the well being the sole connecting link.

It is not alleged, that every one who inhales privy emanations or imbibes water contaminated with sewerage, will necessarily have typhoid fever or any other severe form of disease, any more than that all who take alcoholic poison will be affected with delirium tremens. A certain amount and continuance of the poison, in either case, and a certain susceptibility of the system will be required to produce the effect, but this does not prevent the conclusion, that faecal emanations and alcoholic drinks respectively, cause typhoid fever and delirium tre-

mens. Neither is it affirmed that the peculiar poison which produces typhoid fever is generated in every form of animal matter undergoing decomposition, or that it is present in every putrid odor; but that an injurious influence is exerted by taking into the system such matter may be safely alleged; and that typhoid fever and other severe diseases are frequently thus produced, no longer admits of a reasonable doubt.

In further confirmation of these views, Dr. Anstie of London, editor of the "Practitioner," whose writings have recently attracted so much attention from the profession, in his "Notes on Epidemics," says:

"Of exciting causes, two are recognized as outweighing in importance all the rest. The first is the direct introduction of decomposing organic matters (and possibly of organic germs developed from this source) into the alimentary canal, by the agency of impure drinking-water; and, secondly, the inhalation of the gases formed in the decomposition of organic matters, and possibly specific germs along with these. Of the former mode of origin it is easy to find countless examples in the medical history of our country towns. . . . The following are the typical conditions in which typhoid fever arises from impurities in drinking-water (we write with a well-remembered instance in our mind). A country town, without deep drainage, disposes of its sewage in cess-pools; and the limited space in which the houses stand renders it inevitable that the drinking wells should be within a very short distance of the cess-pools. From the latter a continual oozing of decomposing organic matter takes place, and more or less of this finds its way into these wells. For years, possibly, no particular harm can result from this, but at length there comes a long, dry summer, which reduces the water to a low ebb, and concentrates its impurities, besides favoring decomposition. In such circumstances, typhoid fever breaks out among the persons who drink the water.

"Such is the story which scores of country towns have repeated in their own experience. But there is another mode of origin of which we possess examples of apparently equal accuracy. A hot, dry season favors decomposition, as we have already said; under these circumstances, sewage gases ascend through the imperfect traps of the drains into the interior of the houses; and of this, also, an outbreak of typhoid is of frequent consequence. . . . In short, all observers arrive at the conclusion, that it would be possible, by rendering our drinking-water absolutely pure, and by disinfecting our sewage at the earliest moment, almost or entirely to suppress typhoid fever."

In view of these and many other facts and opinions which might be cited, the great hygienic importance of this subject can but be appreciated.

We shall not now enter into an examination of the perfection or imperfection of the sewerage of the better class of houses in the larger cities, supplied with an abundance of water having sufficient fall to carry rapidly away all faecal matter, mingling it with a large body of moving water. Comparatively few human habitations are, however, thus provided for—almost none except in large cities. But to the great mass of residences in the smaller towns throughout the country and to many in cities, what we have to say will apply.

The common prevalent privy system, throughout our country, if it may be called a system, is simply and absolutely an *abomination*. A hole is dug in the ground, often built up with mason work, and even with water lime in some instances, so as to retain its contents, and the faecal and urinary deposits mingled with the slops of the chambers are thrown into it and left to ferment and putrify indefinitely, the new material constantly added, readily taking on the putrefactive processes already existing. All that does not pass off in offensive gases, poisoning the air, remains in the vault, or possibly passes into the moist earth and soaks its way with flowing water into a neighboring well. Some vaults are deep, admitting of deposits for many years, while others are superficial, their contents overflowing and saturating the surrounding soil. And when attempts are made at removal, the whole neighborhood is rendered horrible and dangerous. The vaults of the Maplewood privies were comparatively superficial and filled to overflowing, and just before the outbreak of the sickness, one was cleaned out on a hot night, producing odors described by the students as “perfectly dreadful.” One need not go very far in any country village, or in most cities to see this general description realized in all its disgusting details, attended by the consequences to health and life already referred to.

Fortunately for this state of things so long endured there is a remedy, certain, effectual, and easily applied, and the object of this article is to call the attention of our professional readers as forcibly as possible to the evil and its remedy, knowing that through them all important sanitary reforms must be accomplished.

The remedy consists in mingling with dry and porous earth immediately all excreta. In so doing its particles are brought so in contact with the substance of the earth as to effect chemical changes, rendering the matters inoffensive and innocuous, preparing them for en-

tering vegetable organisms as a part of their proper nutrient pabulum. This is no newly discovered principle or modern practice. It was enjoined by Moses as an important hygienic measure, when (Deuteronomy xxiii. 12 and 13,) a paddle was directed to be provided for each weapon, to be used as there especially directed; while the Chinese and Japanese, as a fertilizing rather than hygienic measure, return immediately to the soil all material of this kind; and before the time of Moses or Chinese history, the instincts of our domestic carnivora caused them to select for their deposits a place where light dry earth enables them to bury beyond the reach of the senses these offensive materials.

Though the principle is so ancient, we are indebted to our British brethren for impressing its importance upon the profession and community.

Many professional and scientific gentlemen, both in Europe and in this country have been engaged in investigations and experiments on the subject, and many interesting facts have been established with which all interested in sanitary science should be familiar. It is found, that if each fecal deposit be immediately covered with a moderate quantity, say a pint and a half of *fine, dry* earth, all offensive odor is instantly extinguished, fermentation and putrefactive changes are prevented, the moisture of the material is absorbed and finally evaporated, without carrying other matters with it, the particles are so brought in contact with those of the earth, that such physical and chemical changes occur as to fix the organic compounds, and render the mixture free from offensiveness, so that it may be kept in one's sleeping apartment without annoyance, and may be used again and again, effecting the same purpose as fresh earth.

The disinfection seems to be analogous to that of charcoal and gravel, in the process of filtering filthy water, clearing it from organic impurities, while the filter itself, even after long use remains free from offensive qualities. In both instances, not merely absorption, but chemical changes occur, oxidation is effected by particles being brought in close contact—combinations with the oxides of the soil may occur; at all events, the purifying effect is realized. The exact chemical process in all its parts is not at present understood, but Professor J. T. Way, when acting as Chemist to the Royal Agricultural Society of England, showed by his experiments respecting the power of soils to absorb manure, that a very strong action, either chemical or physical occurs between the alumina of the soil and different forms of organic matter, especially various products of decomposition. He attributes

the effects to the double silicates and some other base that are found in all clays, and describes a decomposition of these double silicates, by the alkaline products of organic matter.

Dr. Angus Smith, in his work on "Disinfection," says. "Every substance in fine powder disinfests—dust of all kinds, whether platinum powder or dust of sandstone. The surface is enormously increased in such bodies, and surfaces attract the air, which is confined and pressed into service, causing more active oxidation and therefore more purification."

The researches of Pettenkoffer, of Germany, have brought him to a full recognition of the dangers of faecal and other organic decomposition, aided by stagnant water, and also of the efficacy of dry earth as a disinfectant.

Prof. S. W. Johnson, of Yale College, who has given careful attention to this subject, confirms the views already expressed of the efficacy of dry earth as a deodorizer and disinfectant. From hundreds of practical observations, no less than from these more scientific investigations, the convenience and excellence of this system of purification is now clearly established.

Arrangements for carrying out this plan for disposing of human excreta need not be complex or expensive, and with a little care may be adopted everywhere; though for the sake of convenience and elegance, particular contrivances are of great use.

The most unpleasant part of the reform will consist in getting rid of existing privy vaults. The accumulations should be removed, the offensiveness being diminished by mingling with soil, and the vaults filled with fresh earth. The seats of the privy should be so arranged as to admit of a tight box being placed underneath and protected from rain. A quantity of dry earth should be obtained, (the dust from the road, or the surface of a field or garden, collected in a dry season, or sifted coal ashes will answer, though earth sifted and artificially dried is better) and placed in a box in the outhouse. A small shovel or scoop should be provided, and after each use of the privy, a sufficient quantity of earth should be thrown into the box to simply but completely cover the deposit. When the box is filled, provision having been made for it in the construction of the privy, it may be removed without the slightest offensiveness, and its contents returned to the field or garden; or where the earth is artificially dried, or more difficult to be procured, it may be used after becoming thoroughly dried, a second, third, or fourth time, in the same manner as the fresh earth,

becoming at length as valuable for fertilizing purposes as the best guano.

Though many of our own profession have aided in the development of this subject, to no one are we so much indebted as to the Reverend Henry Moule, of Fordington Vicarage, Dorsetshire, England, whose experiments and writings have been extensive, and who has invented a "self-acting" and "pull-up" earth closet apparatus, by which the earth being placed in a hopper, each deposit is at once covered. These closets are so arranged as to become fixtures in wood-sheds, coal-cellars, dwellings, or any convenient situations, or in the form of a movable commode, constituting a piece of furniture, which may be placed in a dressing-room or chamber, in a hospital ward or sick room, and with proper ordinary care is perfectly free from offensiveness to the eye or any of the senses.

A patent, both in England and this country has been obtained for this apparatus, which is only a convenient method of using the earth in closets and commodes; but the principle of using dry earth as a disinfectant, is too ancient and too elementary to admit of any restrictions, and is of course free to all.

If the principle which we have thus imperfectly stated, be correct, its great importance in an economic as well as hygienic point of view must be admitted. Although we, particularly in the West, have a vast extent of nearly virgin soil, abounding in all necessary elements for the production of crops, yet if those elements are constantly removed and not restored—if the rich materials which are produced from it, and enter into the food of man be buried deeply, or washed into the sea, the ultimate exhaustion of that soil can only be a question of time. The Cloaca Maxima of ancient Rome, carrying the waste of that great city into the Mediterranean, by the impoverishment of the soil, has been regarded as among the chief causes of the fall of the Empire.

The earth system, with its accessories of closets and commodes as now contrived, promises to effect several specific objects, among which the following may be enumerated :

(1.) To afford a comfortable closet on any floor of the house, which may be supplied with earth and cleansed of its deposits, without annoyance or inconvenience. (2) A portable commode, in any dressing-room, bed-room or closet, the care of which is no more disagreeable than that of a stove. (3) Appliances for the use of immovable invalids, which entirely remove the unpleasant accompaniments of their care. (4) The removal of the most fertile source of typhoid fever

and various other diseases. (5) "The complete suppression of the odors, which despite the comfort and elegance of modern living, still hang about our cess-pools and privy vaults, and attend the removal of their contents." (6) The complete deodorization of the bucket so commonly used in jails and prisons. (7) The realization of a fertilizer of material value to the agriculturist.

The great test as to the fulfilment of these promises is to be found in the actual use of the earth system. For this test those who have not had personal observation and experience, must rely upon the testimony of those who have.

Our own observation, if all other evidence scientific and practical were wanting, is sufficient to convince us of the substantial reliability of these promises.

We have seen the plan in operation upon a large scale at Fort Adams, Newport, R. I., where a large number of soldiers were using the earth closets, and where there was an entire absence of all those odors, which we have never before failed to perceive even in well-regulated water closets used by a large number of persons. We have seen the earth commodes in use in hospitals and private dwellings, and where proper care was exercised, with the most complete success.

We have directed the use of earth in the sick room in a common *pot de chambre*, having a small quantity of dry earth kept in a pail in the room for that purpose, placed in the vessel before its use and immediately covering the evacuation afterwards, thus extinguishing all odor at once, and allowing the vessel to be emptied at the convenience of the attendants, with no disagreeableness whatever.

The testimony of others might be quoted to almost any extent. Francis G. Smith, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, says he has used the earth closet "with entire satisfaction," regarding it "as not only a great convenience," but as an equally great "hygienic improvement."

Colonel D. C. Houston, U. S. A., from his observations at Fort Adams for several months, says the earth closets "give entire satisfaction, completely answering the purpose for which they are designed," that the "commodes are of great advantage in cases of sickness and in hospitals," and that "the soldiers' closet worked perfectly."

Brevet Brigadier General John M. Cuyler, M. D., Surgeon U. S. A., gives his unqualified approval of the system.

Dr. R. S. Stewart, of the Maryland Hospital, Baltimore, after a trial of its use says he "recommends it to his fellow citizens as one of the most important inventions of the age."

Dr. L. B. Wilcoxson, of the Connecticut State Hospital, where the earth closets and commodes had been in use for six months, says "the deposit is completely deodorized and is no more offensive to the sight or smell than an equal quantity of coal-ashes."

Dr. John H. Rauch, Sanitary Superintendent of Chicago says: "I have for the past three years examined and witnessed the practical working of the earth closet, and am satisfied that under a great variety of circumstances, it affords the best means of disposing of night-soil, with reference to both sanitary and economical considerations."

Dr. Addinell Hewson, of the Pennsylvania Hospital, Philadelphia, says, "Having tested the earth closets with my patients in the hospital, in a manner which may fairly be said to be a very severe one, I am confident that it * * fulfills all the requirements of such a convenience for a hospital, as well as for a sick chamber or for family use."

The only question respecting the practical workings of the system; not perfectly settled by the arguments and testimony already adduced is, as to whether the disease-producing qualities of night-soil are destroyed by this process of deodorization. The absence of any cases of disease being traced to excreta thus treated, during the time the system has been in operation in this country, is not sufficient to establish its entire innocuousness; but when it is remembered that the injurious effects of night-soil, when not containing the germs of specific contagions, depend upon the fermentative decomposition of the material, and that this is prevented by the dry earth treatment, we can have little difficulty in concluding, that the plan in all ordinary cases is effectual. It has been tried for five years in British India, in jails with seven hundred and even fifteen hundred inmates, and it is stated, that no outbreak of fever or cholera has occurred; and Dr. Mouat, in his Report of the Jails of the Lower Province of India, though not feeling sure that it is safe in cases of infection to speedily return the excreta beneath the soil, yet he regards the dry earth system incapable of being overrated in its benefits upon public health. Farther experience may be needed to demonstrate the complete disinfection of faecal matter by dry earth, especially where specific or contagious germs are presumed to be present. If in these cases, the plan is not proved to be perfect, it is doubtless the best of which we have any knowledge; and only during the prevalence of such diseases as are supposed to be capable of being propagated by contagious germs from the intestines, does danger seem possible.

The object of this article has been to call attention to the principle of disposal of excreta through the medium of dry earth, and to

the proofs of its efficacy and importance, rather than to enter into details of the methods of procedure. These are given in a pamphlet on "Earth Closets and Earth Sewage," by George E. Waring, Jr., of Newport, R. I., to which I am indebted for many facts stated in this article.

It may not be inappropriate, however, in conclusion to say, that the earth for use in closets must be dry; not necessarily dried by artificial heat, but made as dry as it can be by exposure to air and by the exclusion of rain. It must contain enough allumina or clay to give it sufficient absorbing power. It must be sifted of its stones and coarser particles. The mechanical arrangement must be such, that a sufficient quantity of earth will be with certainty deposited to cover the *faeces* and to absorb the urine of the single evacuation, and the accumulation under the seat must be occasionally raked down or leveled off in the vault. When the receptacle has become full, its contents must be removed, and the supply of dry earth must always be on hand. If the earth is to be again used, time must be allowed for its moisture to be completely evaporated, and for its organic matter to be thoroughly incorporated with the earth. For this purpose it may be placed in a box or open barrel, free to the air but protected from rain. In the country where earth is easily obtained, and readily returned to the garden or farm, a single use is best, as the manure having more bulk can be more evenly distributed; but in this case it should not be used in its fresh state, nor until it is well dried, and any paper which may be present, or other organic particles, as will soon be the case, are lost by minute incorporation with the earth.

This subject for some time past attracting so much attention, particularly in England, and occupying space there in medical and other journals, is deemed worthy of the space here given it; and it is hoped our readers will give it such attention as to enable them to confirm or correct the statements made.

